

THE ASSOCIATION BETWEEN LEARNING STYLES AND PREFERRED TEACHING STYLES

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Abstract

Although the hypothesised constructs of learning styles and teaching styles have been studied separately, the association between the two has not yet been identified. The study used survey responses from 272 undergraduate students' preferences to identify the links between student self ratings of their learning styles and their preferences for teaching style. Results indicate that learners with a dominant reflector style are influenced by their perceptions of the teaching style of the teacher or lecturer. Implications for this result are targeted at lecturers, teachers and other educators. This is the first empirical study to identify a relationship between the popular yet criticised learning styles and teaching style preferences.

It is generally accepted that the manner in which individuals choose to or are inclined to approach a learning situation has an impact on performance and achievement of learning outcomes (Cassidy, 2004). Learning styles have been the focus of extensive research and as a result there exist a variety of definitions, theoretical positions, models, interpretations and measures of the construct (Cassidy, 2004).

An individual's learning style is said to develop as a result of a particular cognitive style. Reynolds (1997) posits that personal cognitive abilities acquired in the course of a long socialisation process are referred to as learning styles. Riding and Cheema (1991) warned of the potential of confusing learning style with ability, suggesting that learning style exists independently of ability. Some tasks may seem easier for one individual than another simply because the task may be better suited to one individual's cognitive style. Learning styles may be considered both as a stable structural trait and a dynamic process state. Cassidy (2004) suggests a learning style may exist in some form, but that the structure is to some degree responsive to experiences as well as the situational demands to enable change and adaptive behaviour.

Advocates of learning styles have developed and tested models of learning styles based on theoretical models of the preferred way in which individuals approach tasks or learning situations. Kolb (1984) has contributed extensively to learning styles theory by pioneering experiential learning theory, suggesting people learn from their experience. A central theme of Kolb's theory states that the learning process differs across individuals as a result of heredity, life experience and environmental circumstances.

Learning was conceived as within a four-stage cycle (Kolb, 1984). Immediate concrete experience is the basis for observation and reflection. An individual uses these observations to build an idea, generalization, or theory from which new implications for action can be deduced. These implications or hypotheses serve as guides to create new experience. Learners, to be effective, need four kinds of abilities: concrete experience, reflective observation, abstract conceptualization and active experimentation (Kolb, 1981, p. 111). In the process of learning and especially in particular situations, individuals move in varying degrees from actor to observer and from specific involvement to general analytic detachment. Learners may start at different phases of the cycle. Some individuals integrate and use all four learning modes while for others some learning modes will dominate, but every individual develops a

specific learning style. The experiential learning theory represents an integration of research on learning styles and conceptualizes the learning process. Kolb's theory has been criticised for theoretical weaknesses and contradictions (Garner, 2000), particularly learning styles dynamics. Assigning learning styles to individuals and associating particular learning styles with particular disciplines implies that learning styles are stable, yet Kolb argued that learning styles are flexible to respond to the learning context.

Kolb's model influenced and inspired several other learning style models emphasising different cognitive and psychological aspects of learning style. Some models focus on cognitive and perceptual differences, including verbalist or imager and wholist or analytics (e.g. Rayner & Cheema, 1991); sensory modalities, including visual, auditory, kinesthetic (e.g., Riding, 1997); or personality/psychological types (e.g. Rayner & Riding, 1997). Information handling domains in the four categories of processing (active or reflective), perception (sensing or intuitive), input (visual or verbal) and understanding (sequential or global) are used in Felder and Soloman's (1992) Inventory of Learning Styles. A learning styles model proposed by Curry (1983, 1987) uses the four layers of an onion as a metaphor to represent the inner and outer layers of the construct –instructional preference, social interaction, information processing, and cognitive personality style.

To measure individual orientations toward learning, Kolb developed a self-description assessment, the Learning Styles Inventory (LSI), a nine-item self report questionnaire requiring respondents to rank four words, revealing a preference in the learning modes (Rayner & Riding, 1997). The first learning style score reflects the respondent's position along the abstraction-concreteness learning style dimension while the second score reflects their position along the reflection-activity learning style dimension (Rayner & Riding, 1997). The LSI's psychometric properties have been criticized in a reliability generalization study where internal consistency and test-retest reliabilities fluctuated considerably (Henson & Hwang, 2002). Statistical limits of ipsative data, making reliability and validity

evaluation inappropriate, have been highlighted (Pickworth & Schoeman, 2000).

Honey and Mumford's Learning Styles Questionnaire (LSQ) (1986; 1992) closely corresponds to Kolb's (1976) model and is an alternative to the LSI (Cassidy, 2004). Learning style, as used by Kolb (1984) and Honey and Mumford (1992), describes an individual's preference for understanding their experiences and transforming those experiences into knowledge. The LSQ measures four learning styles: activist, reflector, theorists and pragmatist. Activists involve themselves in new experiences, tackle problems by brainstorming and move from one task to the next as the excitement fades. Reflectors tend to be cautious and thoughtful people who like to consider all the possible angles before making decisions and whose actions are based on observation and reflection. Theorists integrate their observations into logical models based on analysis and objectivity whereas pragmatists are practical people who get impatient with reflection, preferring to apply new ideas immediately (Honey & Mumford, 1986).

Given its origins in Kolb's LSI, it is not surprising that the LSQ has been criticised for the same types of problems (Cuthbert, 2005). Swailes and Senior (1999) factor and cluster analysis revealed unsatisfactory construct validity of the LSQ, with more than a third of items not sufficiently discriminating between learning styles. Sadler-Smith (2001) argued the LSQ does yield four factors, but suggested it might be measuring learning processes rather than learning style. Similarly, Duff (2001) reported a failure to validate the learning style construct using the LSQ. However Pickworth and Schoeman (2000) found both the LSI and the LSQ produced four factor solutions and high internal reliability. LSQ studies generate mixed psychometric results.

One of the strongest of many arguments against learning styles is Reynold's (1997), that the use of styles encourages a positivistic and individualistic perspective in learning, encouraging labelling and stereotyping whilst ignoring the personal historical context leading

up to the learning. Sadler-Smith (2000) leads an equally strong argument against learning styles, claiming that the term learning style was used too readily to describe a variety of individual difference constructs. To remedy the claims of Reynold (1997) however, Sadler-Smith (2000) proposes the application of Riding's model (1997) which makes it clear that (a) learning strategy and cognitive style are linked (b) learning style is based upon internal cognitive aspects of the individual, and (c) the learning strategy used by the individual is the individual's response to the learning context. Thus the use of learning styles concept does not necessarily decontextualise individual differences in learning (Cuthbert, 2005). Many practitioners avoid the issue of lack of agreement on assessing styles (Sadler-Smith, 2000) by using Kolb's LSI (Kolb, 1976) or Honey and Mumford's LSQ (Honey & Mumford, 1986).

Various studies attempting to understand the relationship between personality and academic achievement have concluded that relationship is moderated by both learning and teaching style. That is, people show a preference for a particular style of learning, and the speed and efficiency of their learning is a function of their most and least preferred style (Furnham, 1992).

Recent education research has focused on which classroom pedagogies best enhance student learning, teacher-centered or student-centered (Giles, Ryan, Belliveau, De Freitas, & Casey, 2006). Traditional teacher-centered environments leave little to no room for student interaction and merely involve the delivery of content through lectures or other means by the teacher. According to Halperin (1994) teacher-centered classrooms are those in which students sit quietly, passively receiving words of wisdom being professed by the instructor in front of the class. Learning, however, rarely if ever occurs passively. Instruction is most effective, according to cognitive psychologists and educators, when students are encouraged to become actively involved in their own learning (Catalano & Catalano, 1997). Student-centred classrooms achieve this type of interaction and require teachers and professors to be more nurturing, taking on a more of a coaching type approach with

students. According to Giles et al (2006) constructivists view learning as an individual inquiry-based process that is facilitated by the teacher (Nominshan, Bourbeau, Tessier, & Pollock, 2001; Watson & Konicek, 1990). While there is growing evidence that student-centered learning activities and classrooms result in deeper understanding, improved critical thinking skills and synthesis of information (Watson & Konicek, 1990) in addition to promoting the development of higher-order skills such as critical thinking and problem solving (Barab & Landa, 1997; Gallagher & Stepien, 1996), there is support for the teacher-centered classroom, especially when lectures are presented with enthusiasm and creativity (Frederick, 1986).

Matching teaching style to learning style is said to result in a deeper understanding and more positive subject attitude (Felder, 1993; Felder & Silverman, 1988). Felder and Silverman (1988) propose a model for engineering students that outlines a parallel between 32 types of learning styles and teaching styles. Their reasoning is that a student who favours intuitive over sensory perception in the form of learning, for example, would respond well to an instructor who emphasises concepts (abstract content) rather than facts (concrete content). In contrast, some researchers have reported either ambiguous results or no significant difference with inquiry-based classes or matching learning styles with teaching style (Curry, 1990).

While research has been prolific around learning styles, very little attention has been paid to teaching styles. Thompson (2002) examined the important aspects of university MBA teachers in Hong Kong from the perspective of the students. A scale relating to good management teaching was used on 130 Chinese executive MBA students. Students were required to respond to an open ended question about what they regarded as the key facets of “a very good MBA teacher”. To construct the instrument, all points raised by two or more respondents in written qualitative responses were noted. Responses to the open ended question fell into five broad conceptual categories of teaching abilities, personal qualities, individual business credentials, individual academic credentials and

course and class administration and practices. The first category refers to teaching abilities related to engendering of curiosity and a desire to learn among students, while the second category refers to a wide spectrum of characteristics, ranging from enthusiasm, open-mindedness and a sense of responsibility. The third category refers to individual business credentials and experience. The final category about course and class administration, relates to a very wide range of teaching devices and classroom methods spanning class timing, provision of notes, assessment procedures and even use of overhead projectors. Items yielded reliability from .64 to .82.

Thompson (2002) found that a good teacher needs to have teaching abilities that simulate student interest and facilitate an inquiring, friendly, openly discursive class atmosphere. A teacher needs to have personal qualities that make the achievement of such an open, inquiring, and convivial class atmosphere possible. These personal qualities include enthusiasm about teaching, about specific discipline taught and about business generally. They also include a sense of concern and responsibility toward students, plus a broadly open-minded and friendly outlook receptive of considerable direct student contact and criticism. A third area of important MBA teacher attributes concerns individual credentials. Finding Hong Kong Chinese students valued direct business-related credentials more so than formal and academic credentials.

Few researchers have examined the association between teaching and learning styles. Felder and Silverman (1992) applied their own list of 32 learning styles and examined the compatibility of learning styles of engineering students with the teaching styles of engineering professors and concluded a complete incompatibility. They stressed the importance of teachers and professors engaging a diverse range of learning styles through their teaching.

It could be said that learning and teaching styles represent the same complex processes but from different standpoints. Students learn in many ways – by seeing and hearing, reflecting and acting, reasoning logically and intuitively, memorizing and

visualizing and drawing analogies and building mathematical models (Felder & Silverman, 1988). Teaching methods also vary, whereby some instructors lecture, others demonstrate or discuss, some focus on principles and others on applications, some emphasize memory and others understanding. How much a given student learns in a class is governed in part by that student's native ability, prior preparation and also by the compatibility of their learning style and the instructor's teaching style (Felder & Silverman, 1988).

The idea that 'style awareness' may help reach the 'hard to teach' and perhaps contribute to reducing failure generally by enhancing the learning process is an "elusive but tantalising prospect which clearly merits further attention" (Rayner & Riding, 1997, p. 21). The current interest in teaching and learning styles is evident not only in schools, but also in higher education, work-place training and professional development. According to Rayner and Riding (1997) what remains apparently beyond reach is the systematic operationalisation of style in learning, teaching, training or management (Rayner & Riding, 1997). From theoretically linking teaching styles with learning preferences, the aims of this study become evident. The purpose of this study is to determine to what extent there is a relationship between learning styles and teaching styles. It is expected that an individual's learning style will predict the degree to which an individual is influenced by the teacher's teaching style. It is hypothesised that:

Hypothesis 1: The four hypothesised learning styles will have dissimilar relationships with the hypothesised teaching styles.

Method

A total of 320 second and third-year undergraduate students participated in a wider study on student attitudes. Students were given the option to participate and were not penalised for nonparticipation. Paper surveys were distributed in the second week of semester and 300 were returned, a 94% response rate. After removing 88 respondents with missing data, the final sample

was 272, including 193 females and 75 males, with a mean age of 21.25 (SD = 2.76).

Materials

Learning styles full scales: All 80 items in the Honey and Mumford's (1986) Learning Styles Questionnaire (LSQ) were used. Twenty items represented each of the four learning styles: activist, reflector, theorist and pragmatist. Responses to all items were on a five point Likert scale with 1 = *strongly agree* to 5 = *strongly disagree*. An example of an item on the theorist scale is "I have strong beliefs about what is right and wrong, good and bad". An example item from the activist scale is "I often act without considering the possible consequences". A pragmatist example item is "I have a reputation for saying what I think, simply and directly" and a reflector item is "I like the sort of work where I have time for thorough preparation and implementation". The responses to each of the twenty items on the activist, pragmatist, reflector and theorist scales were summed to form the score for each respondent on all four scales.

Teaching styles: All 46 teaching quality items developed by Thompson (2002) were used. Respondents indicated to what extent they either agreed or disagreed that the items were "Very important aspects in making a lecturer an exceptionally good one". An example item from the teaching abilities scale is "ability to stimulate new ways of thinking", from the individual business credentials scale is "local business experience", from the individual academic credentials scale is "high level of academic qualification (PhD)" and from the course and class practices scale is "concern to fit out-of-class workload to student's time schedules". Responses to all items were on a five point Likert scale with 1 = *strongly disagree* to 5 = *strongly agree*. Responses to items on each of the teaching abilities, personal qualities, individual business credentials, individual academic credentials and course and class practices scales were summed to form respondent scale scores.

Results

Means, standard deviations and Cronbach alpha reliabilities and inter-correlations are presented in Table 1. Scale reliability was acceptable at .70 to .83 for most scales although a little below the recommended .7 for pragmatist (.67) and theorist (.65). In support of the hypothesis, many of the scales were significantly correlated with each other.

To identify possible sources of misspecification and scale discrimination, we created a measurement model for each of learning styles and teaching styles. The four scales for each of the learning styles demonstrated good discrimination. Correlations varied from .00 between activist and theorist and -.10 between pragmatist and reflector, up to .55 between pragmatist and theorist and .58 between reflector and theorist. The five teaching styles demonstrated good discrimination in a measurement model. Correlations varied from .29 between teaching abilities and individual academic credentials to .65 between teaching abilities and personal qualities. A measurement model combining the learning and teaching styles scales also demonstrated excellent discrimination between the two sets of scales. Discrimination between learning and teaching style scales ranged from .03 between pragmatist learning style and teaching abilities teaching style up to -.25 between reflector learning style and course and class practice teaching style. It would appear that there is no overlap between learning and teaching styles.

The hypothesised structural model was created and analysed using structural equation modelling. The model permitted the summed single item variable for each of the four learning style scales to covary. The teaching style scales were represented by a single latent variable. Relationships between each of the learning styles and the teaching style latent variable were examined. Nonsignificant paths were removed and modification indices were inspected to

Table 1: Means, standard deviations, reliabilities, correlations of learning and teaching styles scales

	Mean	s.d.	1	2	3	4	5	6	7	8	9
1. Pragmatist	53.96	7.12	(.67)								
2. Activist	57.49	7.70	.39**	(.70)							
3. Reflector	50.07	8.20	.25**	-.10	(.76)						
4. Theorist	53.18	7.02	.55**	.01	.58**	(.65)					
5. Teaching abilities	4.16	0.51	-.04	-.07	-.08	-.06	(.76)				
6. Personal qualities	4.18	0.41	-.10	-.07	.16**	-.08	.57**	(.75)			
7. Ind business credentials	3.58	0.68	-.08	-.08	-.09	-.09	.39**	.49**	(.83)		
8. Ind academic credentials	3.39	0.61	-.09	-.10	-.14*	-.11	.29**	.37**	.49**	(.84)	
9. Course and class practice	3.69	0.46	-.14*	-.10	.25**	.22**	.32**	.40**	.40**	.53**	(.81)

** . Correlation is significant at the 0.01 level (2-tailed).

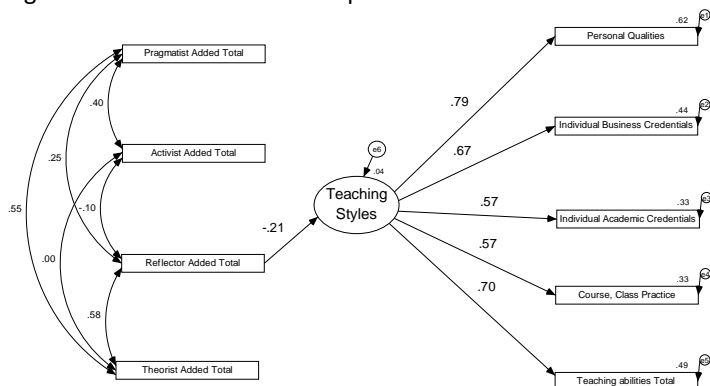
* . Correlation is significant at the 0.05 level (2-tailed).

determine the best fitting model. The final model (Figure 1), resulted in just one statistically significant relationship between the reflector teaching style and the learning styles latent variable.

Given the lack of universal agreement on what would be a single best fit test (Maruyama, 1998), a number of indices are used to assess the fit of the final model. Overall, inspection of the SEM goodness of fit results indicates a reasonable fit between the hypothesised model and the data. The relative chi-square, CMIN/DF = 3.694, slightly exceeds the recommended ratio of less than three (Kline, 1998). The goodness of fit index at .926 is above the recommended value of .9 required to accept a model. Similarly, the

Adjusted Goodness-of-fit index at .862 is slightly below the recommended value of .9. The comparative fit index at .909 is above the recommended value of .9. The incremental fit index at .910 also exceeds the recommended value of .9 required to accept the model. The non-normal fit index, the TLI, at .863 indicates acceptable fit as it is greater than the .8 required. The root mean square residual at .202 suggests a somewhat acceptable model fit given the value is closer to 0. In this case, an RMR of .202 may be interpreted that the model fits the data to within an average error of .202. The root mean square error of approximation, RMSEA, indicates the average lack of fit per degree of freedom and at .10 suggests a poor model fit when the recommended value is not less than .05.

Figure 1: Resultant structural equation model



Discussion

The study sought to establish a link between learning styles and teaching styles. The learning styles were theorised as four variables allowed to covary. Teaching styles were theorised as a latent variable representing five different components of teaching styles. Relationships between each of the four learning styles and the

teaching style latent variable were examined. One significant relationship was found, partially supporting our hypothesis.

The majority of fit indices indicate a reasonable fit between the hypothesised model and the data although some indices suggest a poor fit may be accountable by the underlying and perhaps inherent problems within the learning styles model or measure. There were no significant relationships between activist, pragmatist, or theorist learning style and teaching style. However, the relationship from reflector learning style to teaching style was found to be significant. The size of the relationship, at $-.21$, could be regarded as moderate.

The reflector learning style is said to represent learners who tend to be cautious and thoughtful people (Honey & Mumford, 1986). They apparently like to consider all the possibilities before coming to a decision. Reflectors' actions are based on observation and reflection. There is an argument to suggest why reflectors only – rather than activists, theorists or pragmatists – are impacted by the teaching style of the lecturer in this instance. That argument requires analysis of each of the three non-significant learning styles.

The learner with the dominant activist learning style likes to involve themselves in new experiences, brainstorm problems and moves tasks swiftly. It could be said that none of those activities occur during a standard academic lecture. The lecture could not be regarded as a new experience and a lecture does not include brainstorming. There are rarely tasks in which a learner participates during a lecture, either fast or slow moving. So it could be that the activist learning style individual, while they attend to the teaching style of the lecturer, is not impacted by the lecturer, their background or the lecturer's activities at the front of the lecture.

The learner with the dominant pragmatic learning style on the other hand is a practical person who gets impatient with reflection. They like to apply their new ideas immediately. Again, reluctant resignation may be the behaviour adopted by that type of learner in a lecture setting. Students who have this learning preference may

be able to put aside an hour or two of lecturer style presentation and is again, like the activist, not concerned with the lecturer, their personal or academic background or presentation style. The pragmatist might well wait for the associated tutorial to test out their ideas.

Learners who have a dominant theorist learning style are said to integrate their observations into logical models. This integration is based on analysis and objectivity. It would be reasonable to expect that theorist learners might take a lecturer's academic credentials into account when considering the theories proposed by a lecturer. These results however indicate that if the academic credentials are considered by the theorist learner, the credentials – or other aspects of the teacher – do not contribute to the learner's behaviour to a statistically significant extent.

Returning to the learner with the dominant reflective learning style, however, and the only significant relationship with teaching styles may now be understood. The cautious and thoughtful reflector apparently prefers to consider all possibilities before coming to a decision. If "all" possibilities includes the credibility of the source – that is, the business and academic credentials of the lecturer – then support is found for the significant result. The reflector's actions are supposed to be based on observation and reflection – which may be reflecting the teacher/lecturer's personal qualities, class practices and an overall evaluation of their teaching abilities. The apparent broad, deep and retrospective nature of the reflective learner may explain why only that single learning style demonstrated a preference for a particular teaching style.

The structure of the teaching styles latent variable has room for improvement. The individual academic credentials and course and class practices variables load to the latent teaching styles variables at .57, which is less than the recommended .6 and the preferred .7 loading level. These lower loadings may indicate that students may not view the individual academic credentials and course and class practice variables as teaching styles in the same way that the

students see individual business credentials and teaching abilities. It would appear that academic credentials are not related, in the students' perspective, to teaching styles. Many might argue the truth of that as anecdotal evidence of senior academics is often reported with a full spectrum of teaching standards from very poor to excellent. It has never been claimed that a greater number of academic publications is an indicator of greater teaching ability.

The distinction that students appear to make, however, between course and class practices and the lecturer's teaching abilities is finer. It would appear that students can see the difference between the formulaic pedagogical requirements – some might say prescriptions – of the standards contained in the course and class practices scale (such as “provision of class notes every class”, “frequent feedback on individual student performance” and “use of data projector”) and the deeper learning outcomes of the teaching abilities scale (“ability to stimulate new ways of thinking”, “ability to stimulate questions from students”, “ability to stimulate class discussion”). If this is true, then these student respondents are reflecting an insight into the teaching qualities of the teachers beyond the formal prescribed administrative requirements of many university faculty. It may be that the teaching qualities scale – if found to be improved by the removal of individual academic credentials and course and class practices – may be more correctly reflected in the title of personal teaching style. There is more to uncover in students' perceptions of teaching styles.

This first exploration into the combining of learning and teaching styles has many limitations. Not only is the sample selection of students open to question when the LSQ was designed for managers in business, but the surveys were self report, leading to possible errors in interpretation caused by common method bias. The surveys were cross sectional thereby ensuring no causality may be implied from the findings.

Implications and conclusion. It would appear that learning theory has yet to settle on whether learning styles exist, whether learning

styles measure a style of learning, whether learning styles change with time or context and whether the LSQ measures learning styles. Irrespective of the ambiguity of those issues, however, there appears to be a deeper implication arising from the results of this study. The implication is that individuals who have a dominant reflective learning style – if one is to accept the premise of learning styles – react differently to their lecturer than do individuals with the dominant other – active, pragmatic and theoretic – learning styles. Teachers and lecturers will still need to teach for all “types” of learners in a large class but may gain some comfort in knowing that some learning types attend to details of their teaching. An additional implication is that teachers might wish to articulate the type of learning they, the teacher, would prefer for students to adopt for a particular class. A teacher might ask students who would normally see themselves as active learners to relax into the lecture mode of delivery and reflect on what is said in the lecture, to take time to consider what is said. Yet further research may one day establish whether a lecturer is able to influence their students to adjust their learning style for a particular context. A great deal more work is required in understanding the psychometric properties of the learning and teaching style instruments, the relationships between the two and to confirm the results of this study.

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